

International Mineral Resource and Ore Reserve Reporting

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Note: Slightly modified and presented by Ed Sides (Amecc)

Evolution of estimation terminology

Dates	Mining	Estimation terminology
c. 40,000 BC to present	Artisanal placer and vein workings	Informal or not used
c. 2,000 BC onwards	Small scale vein mining	Agricola (1555) – "head meer"
c. 1,600 AD onwards	Mechanised vein mining	Kendall, IMM (1902) – "ore in sight", "ore blocked out" Fennell (1939) – "ore reserves", "probable ore", "prospective ore"
1939 onwards	Strategic supplies (WW II, Cold War)	1940s ? - "Measured, Indicated, Inferred" (US) 1940s ? - Soviet codes 1972 - McKelvey box
1980s to present	Global investment market	1981 – SEC guide 7 1989 – JORC code, first edition 1994 – CRIRSCO

Note: Slide added by E. Sides

Various sources, including Lacy, W.C. & Lacy, J.C. (1992) "History of Mining" in SME Mining Engineering handbook

Mineral Resource Classification: Relationship to level of knowledge

	Less information		More information	
	Low confidence		High confidence	
	Inferred	Indicated	Measured	
CRIRSCO (most 'Western' countries)				
Russia + FSU countries	P2	P1	C2	C1
			B	A
UN, China	333		332	
			331	

Note: "Scales" on each code are different and may vary from deposit to deposit. Equivalence between codes in the same horizontal position is not implied.

Note: Slide added by E. Sides

International Mineral Resource and Ore Reserve Reporting: The Starting Point?

USBM Geological Survey Circular 831, 1976

Cumulative Production	IDENTIFIED RESOURCES			UNDISCOVERED RESOURCES	
	Demonstrated		Inferred	Probability Range	
	Measured	Indicated		Hypothetical	Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves		
SUB-ECONOMIC	Demonstrated Sub-economic Resources		Inferred Sub-economic Resources		
OTHER OCCURRENCES	Includes non-conventional and low grade materials				

International Mineral Resource and Ore Reserve Reporting: Rapid recent development

Reporting codes have developed rapidly in recent years due to:

- Saga such as Bre-X, 1997
 - Busang, Borneo
- Sarbanes Oxley legislation, 2002
 - Targeted accounting procedures
 - Demanded increased internal controls
 - Improved estimation and reporting (SEC)
- Desire of investment community for transparency and consistency in reporting

Led to concerted moves to reconcile and converge international reporting, headed by CRIRSCO

International Mineral Resource and Ore Reserve Reporting: CRIRSCO

CRIRSCO:

Combined Reserves International Reporting Standards Committee

History

- 1994 : Sun City Council of Mining and Metallurgical Institutions (CMMI)
 - Mineral Resources and Reserves International Definitions Working Group was established.
- 1997 : the Denver Accord
- 1999 : the Geneva Convention
- 2002 : CMMI Working Group becomes CRIRSCO
- 2007 : CRIRSCO joins International Council on Mining and Metals (ICMM) as task force

www.crirSCO.com

Note: Slide modified by E. Sides

International Mineral Resource Reporting: London, 19th November 2007

International Mineral Resource and Ore Reserve Reporting:
CRIRSCO

CRIRSCO's efforts have resulted in:

- Unified approach to reporting
- Most 'western' countries using almost identical resource and reserve definitions and/or guidelines
 - Australasia, Canada, UK & W. Europe, South Africa, Chile
 - USA (guidelines only)
 - Philippines, Peru and other new starters
- High degree of compatibility between codes
- Aids understanding for investors and regulators
- International 'Template' published July 2006

International Mineral Resource and Ore Reserve Reporting:
International Codes today

International Mineral Resource and Ore Reserve Reporting:
Code Convergence

	Australia	Canada	South Africa	UK/W Europe	Chile	Peru	USA-SME	USA-S&E	UNFC
Adoption of CRIRSCO-type standard	✓	✓	✓	✓	✓	✓	✓	X	X
Reporting standard recognised by national regulator	✓	✓	✓	✓	✓	✓	X	✓	X
Competent Person Requirement	✓	✓	✓	✓	✓	✓	✓	X	X
Reporting of Mineral Resources followed	✓	✓	✓	✓	✓	✓	✓	X*	✓
Inferred Resources allowed in economic studies	✓	X*	✓	✓	✓	✓	✓	X	✓
Level of study required for Mineral Reserves	1	2	3	2	2	1	1	3	3**
Commodity price process specified by regulator	X	X	X	X	X	X	X	✓	X
ROPO type reciprocal system	✓	✓	✓	✓	X	X	X	X	X

Level of study:
 1 = appropriate assessments and studies as determined by Competent Person
 2 = Pre-feasibility study - expected (UK/W Europe) or required (Canada/Chile)
 3 = Feasibility study for new projects
 3** = Feasibility study for Proved Reserves, pre-feasibility study for Probable Reserves
 ROPO = Recognised Overseas Professional Organisation
 X* = Allowed in certain restricted circumstances

International Mineral Resource and Ore Reserve Reporting:
USA – significant exception

- SEC
- Industry Guide 7 (1981)
- SME Working Group 2005
- SME Guide 2007 – the way forward?
 - Accepts the use of the term 'Resources'
 - Legal requirements in USA
 - Levels of study (defines a Mineral Reserves Declaration Report)
 - Prices for reserves: acceptance of future price assumptions with pricing test

International Mineral Resource and Ore Reserve Reporting:
The future for reporting: 2. New International Accounting Standard?

- Ongoing discussions with IASB (International Accounting Standards Board)
- Resources and reserves as assets
 - When to recognise them?
 - How to value them?
- On or off balance sheet?
- Resource and reserve classes
 - For reporting
 - Depreciation
 - Impairment
- How to express uncertainty in a financial report
- Agreement among SPE, CRIRSCO and IASB on high level mapping
 - ball now in IASB court

International Mineral Resource and Ore Reserve Reporting:
Similarities & Differences: Petroleum & Minerals

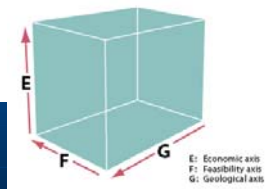
United Nations Framework Classification

- Not commodity specific
 - can include both petroleum and solid minerals
- Based on numerical codes
 - to avoid language ambiguities
- Previous versions (2001 & 2004) don't work for the minerals industry
 - Coding considered OK, definitions are not
 - CRIRSCO is working to better define the codification

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UN-ECE Framework

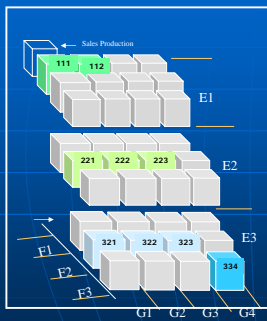
- E1 Economic
- E2 Potentially Economic
- E3 Intrinsically Economic
- F1 Justified Development and/or Production Project
- F2 Contingent Development Project
- F3 Project Undefined
- G1 Reasonably Assured Geological Conditions
- G2 Estimated Geological Conditions
- G3 Inferred Geological Conditions
- G4 Potential Geological Conditions



Source: Norwegian Petroleum Directorate: Ressursrapport_2005

www.npd.no/English/Emner/Ressursforvaltning/Ressursregnskap_og_analyse/Ressursrapport_2005/ress-rapp-05-6.htm

Proposed UNFC



CRIRSCO TEMPLATE



*Not part of the Template but may be used for internal project management

Where next ?

- Establishing common ground with other Resource/Reserve reporting schemes
 - Petroleum industry
 - SEC
 - 'BRIC' countries
 - Brazil, Russia, India, China
- Meeting IASB requirements
- Continued development of standard definitions and guidelines

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